THESIS TITLE : INSECTICIDE IMPACT ON MICROBIAL ACTIVITIES AND CHARACTERISTICS OF ARABLE SOILS

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ABSTRACT

A series of laboratory experiment were conducted on NamPong sandy soil, Korat loamy soil and Ratchaburi clayey soil to determine the impact of insecticides on soil microbial activity and chemical characteristics. Insecticides used were 3 groups as follows:- organophosphates: monocrotophos, metamidophos, methyl parathion, mevinphos and dimethoate; carbamates: methomyl, carbaryl, carbofuran, BPMC[2-(1-methylpropyl) phenyl methylcarbamate] and isoprocarb; organochlorines: endosulfan, heptachlor and chlordane. Each insecticide was applied to the soils according to recommended dose (1X) and double of recommended dose (2X). All of the soil samples received the same amount of alanine as added substrate and incubated at 40^{0}C under aerobic condition for 4 weeks and submerged condition for 3-4 weeks. After each incubation period, soil microbial activity(CO_2 evolution), NH_4^+, available P, $SO_4^=$, Cl^-, pH and EC in aerobic soils were analyzed as well as CO_2, NH_4^+, available P, pH and EC in submerged soils. Due to addition of alanine as soil substrate, this made C:N ratio of the soil system very low and also provided active dynamics to the soil ecosystem.

Results from impact of organophosphates insecticides on microbial activity and chemical characteristics in aerobic soils showed that all kinds of organophosphates(1X and 2X) generally had no impact on neither soil microbial activity nor content of NH_4^+ in sandy, loamy and clayey soils, except metamidophos(1X and 2X) and dimethoate(2X) were slightly harmful to soil microbial activity and decreased NH_4^+ content in clayey soil during the first week of incubation.

Application of any carbamate gave no impact on soil microbial activity in sandy, loamy, and clayey soil, beside application of BPMC(1X and 2X) showed strong effect on soil microbial activity in sandy soil and mild impact for loamy soil. Carbamate (1X and 2X) typically had no impact on content of NH_4^+ in sandy and loamy soil, but gave slight impact for clayey soil.

Any organochlorine(1X and 2X) gave indifferent results in soil microbial activity in sandy, loamy and clayey soil. Only chlordane(1X and 2X) showed strong impact on soil microbial activity in . sandy soil, this impact became less for loamy and clayey soil. Organochlorine(1X and 2X) provided no impact on content of NH_4^+ in sandy and loamy soil. Organochlorine(1X) had no influence on NH_4^+ content in clayey soil while endosulfan and chlordane(2X) decreased NH_4^+ content in clayey soil during the first week of incubation.

All organophosphates(1X and 2X) showed no impact on soil microbial activity in submerged loamy and clayey soil, but it generally showed impact on NH_4^+ content in submerged loamy soil. Application of methyl parathion and dimethoate(1X and 2X) gave serious impact on NH_4^+ content in submerged loamy and clayey soil. Moreover, mevinphos (2X) showed strong impact on NH_4^+ content in submerged clayey soil.

BPMC(1X and 2X), carbaryl(1X and 2X) and carbofuran(2X) resulted weak impact on soil microbial activity in submerged loamy soil; whereas BPMC(1X), carbaryl(1X) and carbofuran(1X) also gave weak impact on soil microbial activity in submerged clayey soil. In addition, carbaryl, BPMC and isoprocarb(1X and 2X) showed some impact on content of NH_4^+ in submerged loamy soil and all carbamates gave strong impact on NH_4^+ content in submerged clayey soil.

Organochlorines gave no impact on microbial activity in submerged loamy soil, but only slight impact for submerged clayey soil. All of organochlorines(1X and 2X) showed strong effect on content of NH_4^+ in submerged loamy and clayey soil.

In general, the insecticides of these 3 groups resulted in no impact on other chemical characteristics (available P, $SO_4^=$, Cl^-, pH and EC) of aerobic and submerged soils, in consequence, it is insufficient to affect growth of plant.

Results which showed negative meanings of tested insecticides, however, are recommended for further investigation, especially for field trials of short and long term. Those insecticides are BPMC(1X and 2X), chlordane(1X and 2X) for upland sandy soil, methyl parathion(1X and 2X) for submerged loamy and clayey soil and mevinphos(2X) for submerged clayey soil, carbaryl, BPMC and isoprocarb(1X and 2X) for submerged loamy soil, all carbamates(1X and 2X) for submerged clayey and all organochlorines (1X and 2X) for submerged loamy and clayey soil.